

NEW MEGOPHTHALMINE LEAFHOPPERS
(HOMOPTERA: CICADELLIDAE) FROM MEXICO, WITH A KEY TO NEW
WORLD SPECIES

D. V. NOVIKOV AND C. H. DIETRICH

Center for Biodiversity, Illinois Natural History Survey, 607 E. Peabody Dr.,
Champaign, IL 61821, U.S.A. (e-mail: dietrich@mail.inhs.uiuc.edu)

Abstract.—Four new Mexican species of the leafhopper subfamily Megophthalminae are described and illustrated: *Brenda gracilicauda*, *B. bidentata*, *B. licrocerca*, and *Tiaja leonensis*. These species extend the known range of both New World megophthalmine genera considerably southeast. A key to New World Megophthalminae is provided.

Key Words: Cicadellidae, leafhopper, morphology, distribution

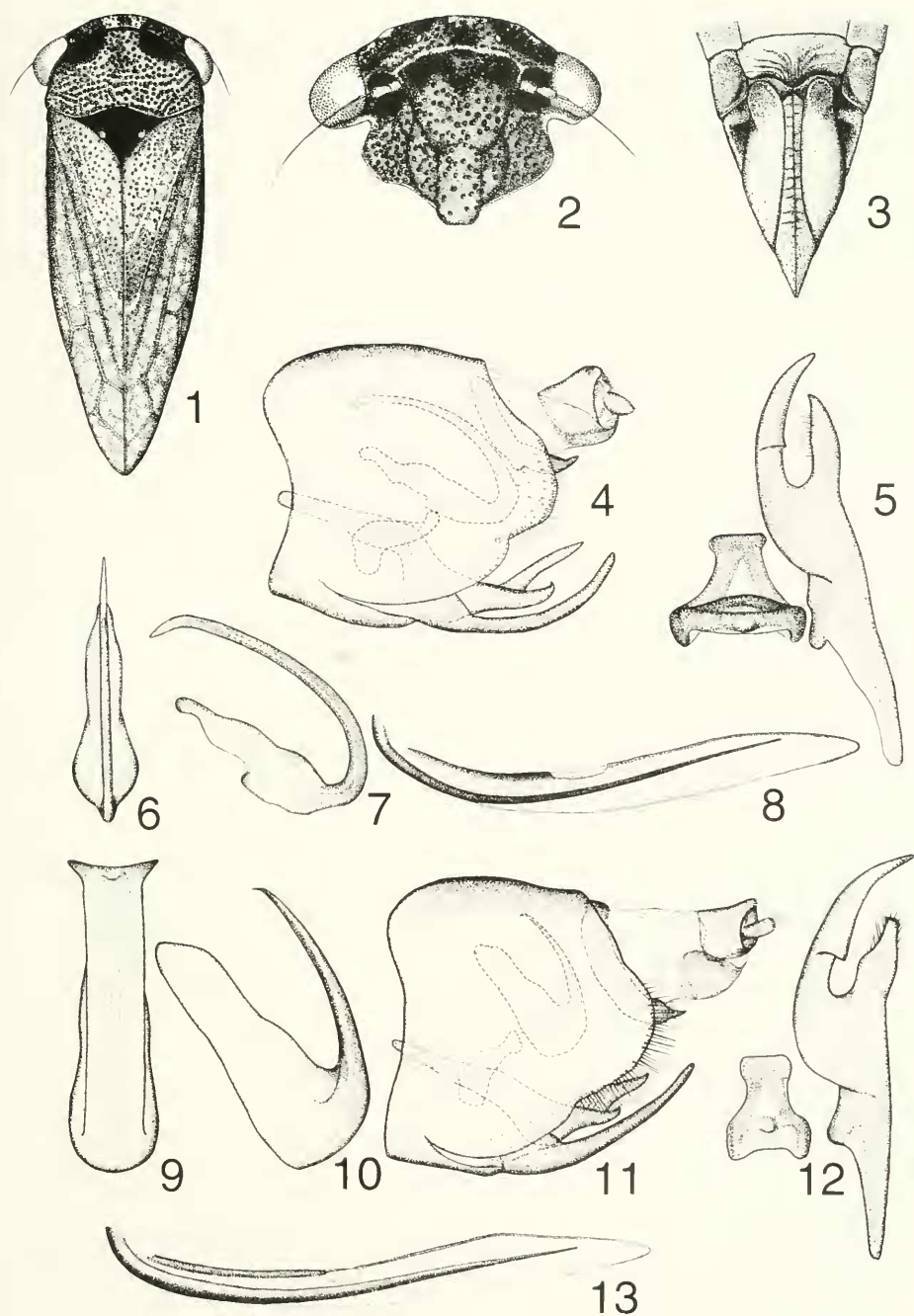
The subfamily Megophthalminae comprises 44 species of small, beetlelike leafhoppers with facial ocelli, carinate frontal sutures, coarsely punctate integument and, often, vestigial hind wings. Species are recorded from Europe, Africa, the Middle East, and western North America (Metcalf 1962, Oman et al. 1990). Most megophthalmine species are apparently restricted to coastal or montane habitats, where they occur in dense, low-growing vegetation, and are seldom collected (Curtis 1833, Edwards 1894, Ribaut 1952, Oman 1941, 1972, Linnavuori 1972, 1973, Sawbridge 1975, Lodos and Kalkandelen 1981, Gill and Oman 1982, Van Stalle 1983a, b).

Recent vacuum collecting (MaCleod et al. 1994) by C. H. Dietrich on low-growing vegetation among rock outcrops in the Sierra Madre Occidental of Sinaloa and Durango states, Mexico, yielded specimens of three undescribed species of *Brenda* Oman, a previously monotypic genus endemic to North America. Specimens of an undescribed Mexican species of *Tiaja* Oman, the only other known North American megophthalmine genus, were found in the insect collection of the Field Museum of Natural History.

In this paper, we provide a revised key to the New World Megophthalminae and describe and illustrate the four new Mexican species. Methods for preparing genitalia follow Oman (1949). Nomenclature for leg chaetotaxy follows Rakitov (1998: AV = anteroventral; AD = anterodorsal; PV = posteroventral; PD = posterodorsal). Specimens are deposited in the insect collections of the Illinois Natural History Survey, Champaign, IL, USA [INHS] and Field Museum of Natural History, Chicago, IL, USA [FMNH]. Types of previously described species were not examined.

KEY TO GENERA AND SPECIES OF NEW
WORLD MEGOPHTHALMINAE
(modified from Oman 1941)

1. Hind wing fully developed. Head with crown broad and short, median length not greater than length next to eye (Fig. 1) *Brenda* Oman, 2
- Hind wing vestigial. Head with crown distinctly longer medially than next to eye (Fig. 19) *Tiaja* Oman, 5
2. Forewing with pits inconspicuous, visible only along veins on basal half, membrane densely shagreen. Male anal appendage with T-shaped preapical hook; style without elongate lateral arm. Female sternum VII shallowly emarginate *B. arborea* (Ball)



Figs. 1-13. 1-3, *Brenda bidentata*. 1, Habitus. 2, Head, anterior view. 3, Distal portion of female abdomen, ventral view. 4-7, *B. gracilicauda*, male genitalia. 4, Genital capsule, lateral view. 5, Style and connective, ventral view. 6-7, Aedeagus, posterodorsal and lateral views, respectively. 8-12, *B. bidentata*. 8, Female second valvula. 9-10, Aedeagus, posterior and lateral views, respectively. 11, Male genital capsule, lateral view. 12, Style and connective, ventral view. 13, *Tiaja leonensis*, female second valvula.

- Forewing with circular pits numerous, conspicuous throughout length, at least along veins, membrane glabrous distally. Male anal appendage without T-shaped hook; style (Fig. 5) with lateral arm at least half as long as apophysis. Female sternum VII distinctly produced medially (Fig. 3) 3
- 3. Aedeagal shaft compressed, in lateral view (Fig. 7) more than 2× as wide as when viewed posteriorly, in posteroventral view (Fig. 6) attenuated, not wider than ¼ maximal width of base, without paired projections apically *B. gracilicauda*, n. sp.
- Aedeagal shaft flattened anteroposteriorly, in posteroventral view maximal width more than ½ maximal width of base, apex with paired processes (Figs. 9, 15) 4
- 4. Margins of aedeagal shaft in posteroventral view (Fig. 9) parallel, apex truncate, with pair of short, acute lateral processes *B. bidentata*, n. sp.
- Aedeagal shaft in posteroventral view (Fig. 15) oval, distad of gonopore forming slender stem branching into pair of triangular processes *B. licrocerca*, n. sp.
- 5. Forewing veins Cu and A1 not distinctly elevated, claval suture not sulcate opposite fork of R and M 6
- Forewing veins Cu and A1 distinctly elevated, claval suture sulcate opposite fork of R and M 7
- 6. Posterior margin of female sternum VI sublaterally produced into pair of bluntly pointed divergent triangular projections, thus forming broad V-shaped medial emargination; sternite VII evident only as broad flap medially, almost completely covered by sternum VI *T. mexicana* (Ball)
- Female sternum VI truncate, subequal in length to sternum VII; sternum VII with posterior margin narrowly emarginate medially (Fig. 18) *T. leonensis*, n. sp.
- 7. Length > 4 mm. Crown short, ratio of width to middle length greater than 3.0 8
- Length < 4 mm. Crown long, ratio of width to middle length less than 2.85 10
- 8. Style with apophysis acuminate. Female sternum VII without U-shaped emargination 9
- Style with apophysis expanded preapically. Female sternum VII with broad U-shaped emargination *T. montara* Oman
- 9. Style very broad at base of apophysis, with well-developed preapical lateral lobe; anal appendage tridentate. Female sternum VII with wide V-shaped emargination comprising entire posterior margin *T. arenaria* Oman
- Style slender throughout length, without distinct preapical lateral lobe; anal appendage bi-dentate. Female sternum VII with posterior margin truncate and usually slightly deflexed medially *T. friscana* (Ball)
- 10. Anal hook with either 2 or 4 points apically. Female sternum VII with pair of rounded lobes laterad of narrow U-shaped medial emargination 11
- Anal hook with 3 points apically. Female sternum VII without U-shaped emargination and lobes, often partially concealed 12
- 11. Anal hook with 2 points apically *T. insula* Sawbridge
- Anal hook with 4 points apically *T. californica* (Ball)
- 12. Aedeagus in lateral view with preatrium elongate; style with width just proximad of preapical lateral lobe much less than length of apophysis. Female sternum VII various 13
- Aedeagus in lateral view with preatrium short; style with width proximad of preapical lateral lobe subequal to length of apophysis. Female sternum VII very short, often partially concealed *T. interrupta* (Ball)
- 13. Male with both preapical points on anal appendage recurved in lateral view. Distribution: Coastal Southern California *T. ventura* (Oman)
- Male anal appendage with only first ventral preapical point recurved. Distribution: Santa Cruz Island, CA *T. cruzensis* (Gill & Oman)

***Brenda gracilicauda* Novikov and
Dietrich, new species**
(Figs. 4-7)

Description.—*Measurements* (mm): Male: length 2.8, pronotum width 1.03, head width 1.12. Female: length 2.8, pronotum width 1.03, head width 1.17. Color. Variable, mottled with shades of reddish brown to black; mesoscutum dark brown with pale posterior corners; scutellum dark brown; forewing translucent, darker basally, with whitish areas at apex of each anal vein and clavus, ground color forming reticulate pattern on membrane. Texture. Circular pits numerous and conspicuous on head, pronotum and forewing in basal half, only bordering veins distally. *Head* (as in Figs. 1-2): Beak attaining anterior margins of hind coxae; clypellus flat, parallel sided medially, rounded basally, apex slightly emarginate, exceeding apical margin of gena. Face weakly convex, with 5 shallow depressions:

1 pair mesiad of antennal pits, 1 pair between eyes and ocelli, 1 between ocelli. Carina formed by frontal sutures obsolete medially; gena broad, deeply emarginate ventrad of eye, section between antennal pit and lorum short and protruding; antennal pit moderately deep, ledge well developed, concealing antennal base in anterior view; antennal flagellum as long as width of frontoclypeus between antennal pits; ocelli on face closer to eyes than to each other; crown very short, broadly depressed between parallel anterior and posterior margins; transition to face prominent, at about right angle. *Thorax*: Pronotum (Fig. 1) slightly convex, with 2 shallow depressions anterolaterally; posterior corners of mesoscutum slightly elevated; scutellum weakly convex. Forewing vein R 3-branched, R₁ originating slightly distad of initial fork of R, 2 r-m and 3 m-cu crossveins present; hindwing as illustrated by Oman (1949) for *B. arborea*, except r-m crossvein present. Prothoracic femur with anteroventral preapical gibbosity; metathoracic femur with 2 apical macrosetae (AD1, PD1); tibial macrosetal formula (PD:AD:AV) 4-5:3-4:4; row PV with one large preapical macroseta and several smaller setae more proximad. *Male genitalia*: Subgenital plate in ventral view parallel sided, abruptly tapered apically. Style (Fig. 5) with lateral arm more than half as long as apophysis; apophysis with toothlike, transverse, ventral ridge at midlength. Connective (Fig. 5) slightly shorter than maximum width. Aedeagus (Figs. 6-7) U-shaped, with long base; shaft moderately compressed, slender, sides parallel, gonopore dorsal subapical, apex in lateral view tapered evenly and acutely distad of gonopore, curved slightly anteroventrad. Segment X ventrolateral appendage (Fig. 4) with subapical projection ventrally, apex in lateral view tapered and slightly curved posterodorsad. *Female*: Sternum VII (Fig. 3) subequal to other sterna in length, transversely rugose, rugae becoming less distinct basally, posterior margin medially with convex lobe comprising $\frac{1}{3}$ width of ster-

num. Second valvula (Fig. 8) slender, dorsal and ventral margins almost parallel basally, apex tapered symmetrically, bearing smaller teeth and having longer dentate section on ventral margin than that of *B. arborea* (Davis 1975: Fig. 9D).

Material examined.—Holotype ♂ labeled: "MEXICO: Sinaloa/rt. 40, 4 km W. El Palmito/el. 2,000 m, 24 Oct 1995, C.H. Dietrich, lot #95-042; HOLOTYPE/Brenda gracilicauda/Novikov & Dietrich." Other material: 1♀, same data, lot #95-046 [both INHS].

Note.—The name of the species is an adjective formed by combining two Latin words, *gracilis* (slender) and *cauda* (tail), referring to the shape of the aedeagus.

***Brenda bidentata* Novikov and Dietrich,
new species**

(Figs. 1-3, 8-12)

Description.—*Measurements*: Male: length 3.0 ± 0.1 ; pronotum width 1.07 ± 0.04 ; head width 1.21 ± 0.04 . Female: length 3.1 ± 0.1 ; pronotum width 1.22 ± 0.08 ; head width 1.09 ± 0.05 . Characters as described for *B. gracilicauda*, except male genitalia as follows: aedeagus (Figs. 9-10) with shaft flattened anteroposteriorly, with two short oblique apical projections, gonopore apical; connective (Fig. 12) relatively narrow; segment X ventrolateral appendage (Fig. 11) without preapical projection ventrally, acutely tapered apically. Female as described for *B. gracilicauda*.

Material examined.—Holotype ♂ labeled: "MEXICO: Durango/rt. 40, 6 km NE El Salto/26 Oct 1995/C.H. Dietrich, lot #95-063; HOLOTYPE/Brenda/bidentata/Novikov & Dietrich." Other material: 2♂, 6♀, same data, lots #95-059, 95-061, 95-062, 95-063 [all INHS].

Notes.—One male specimen lacks crossvein m-cu₂ on both forewings. The name of the species refers to the toothlike apical projections on the aedeagus.

***Brenda licrocerca* Novikov and Dietrich,
new species**
(Figs. 14–17)

Description.—*Measurements*: Length 3.0, pronotum width 1.12, head width 1.27. General appearance like that of the 2 previously described species, but differing in the male genitalia as follows: aedeagus (Figs. 15–16) with shaft flattened anteroposteriorly, with pair of triangular apical processes on slender stem, shaft in posterior aspect oval, at widest point slightly narrower than base, gonopore dorsal subapical; connective (Fig. 17) almost identical to that of *B. bidentata*; segment X ventrolateral appendage (Fig. 14) similar to that of *B. bidentata*, but curved posterad at right angle preapically.

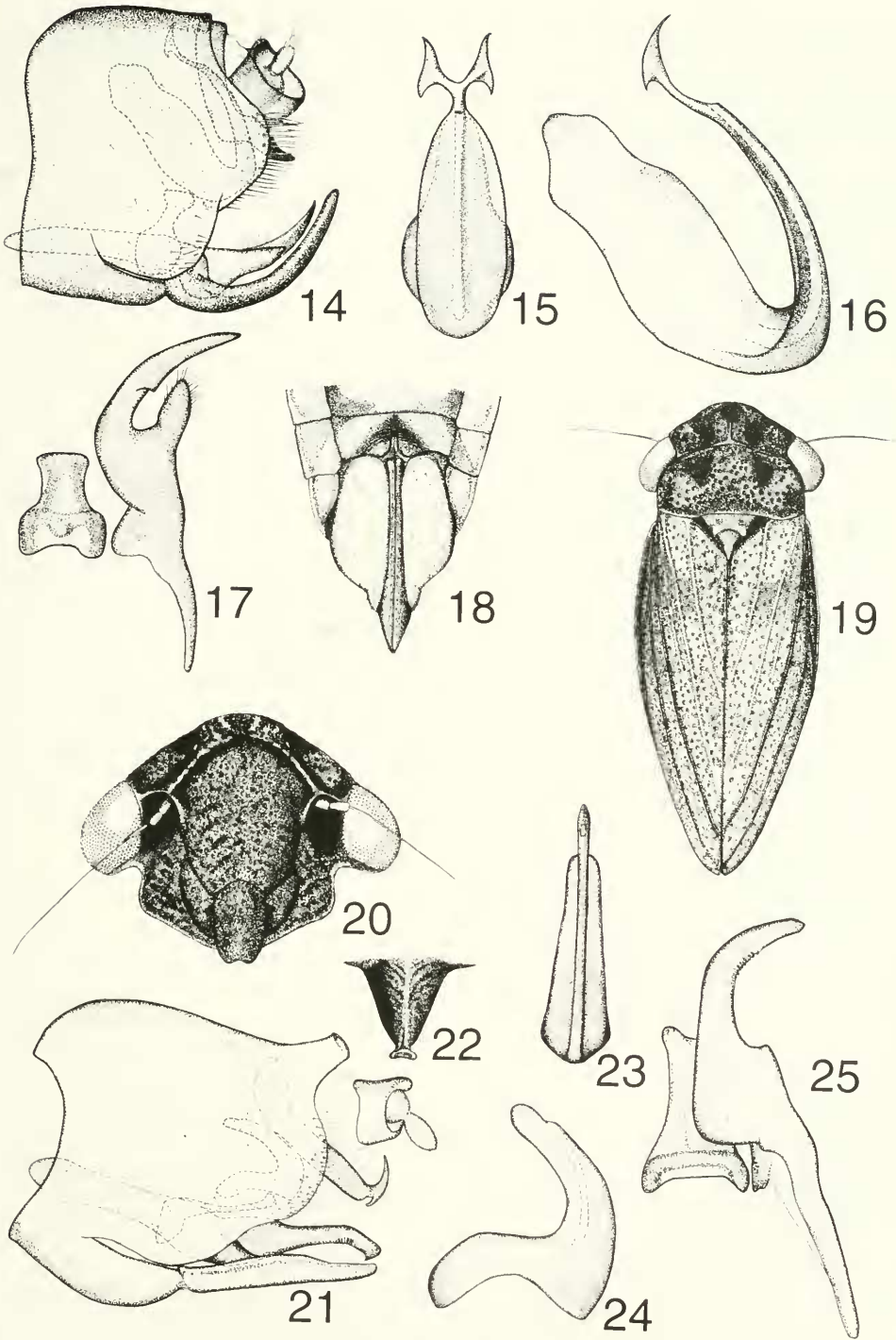
Material examined.—Holotype ♂ labeled: "MEXICO: Durango/E La Escondida/el. 2680 m, 8 Nov 1995/C.H. Dietrich, lot #95-105" [INHS].

Note.—The left forewing of the holotype has vein R 4-branched and 2 s-crossveins. The name of the species combines two Greek words, *likros* (antler) and *kerkos* (tail), and refers to the antlerlike processes at the tip of the aedeagus.

***Tiaja leonensis* Novikov and Dietrich,
new species**
(Figs. 13, 18–25)

Description.—*Measurements*: Male: length 3.0 ± 0.2 ; pronotum width 0.95 ± 0.02 ; head width 1.18 ± 0.04 . Female: length 3.7; pronotum width 1.11; head width 1.35. General appearance characteristic of the genus. Circular pits numerous and conspicuous on dorsum and face. Coloration variable, the following areas more darkly pigmented, in order of decreasing intensity: antennal pit, anterolateral corner of scutellum, venter of thorax and abdomen, dorsum under wing, pronotum mesiad of eye anteriorly, frontoclypeus posterad of carina, crown mesad of eye, center of crown apically, apex of frontoclypeus, ocellus pit, forewing towards costal area. *Head* (Figs.

19–20): Beak attaining hind coxae; clypeus slightly convex, oval, distal margin emarginate, considerably exceeding margin of gena; frontoclypeus weakly convex posteriorly, flat adjacent to the edge of frontal carina, carina prominent laterally, obsolete medially; face dorsad of frontal carina with 2 deep lateral and 1 shallow medial depressions; gena strongly emarginate ventrad of eye, elevated between lorum and antennal pit; lorum slightly convex; antennal pit deep, ledge fully developed, concealing antennal base in anterior view; antennal flagellum longer than width of frontoclypeus between pits; ocelli on face in deep pits, slightly closer to eyes than to each other; crown produced medially, ratio of width to length 2.8, with medial shallow depression; transition to face prominent, forming 60° angle. *Thorax*: Pronotum (Fig. 19) considerably narrower than head, shallowly concave laterally, lateral margins parallel; posterior corners of mesoscutum prolonged and slightly elevated, scutellum small, weakly convex. Forewing with claval suture more or less level with Cu and A, apical portion with inconsistent number of crossveins; anal veins obsolete distally. Hindwing vestigial. Metathoracic femur with 2 apical macrosetae (AD1, PD1); tibial macrosetal formula (PD:AD:AV) 6:6:5; row PV with 5 preapical macrosetae, distal seta larger than others. *Male genitalia*: Pygofer (Fig. 21) projected posterodorsally forming hoodlike structure with T-shaped process apically (Fig. 22); subgenital plate in ventral view slightly tapered, apex rounded; style (Fig. 23) curved laterad distally, apical section attenuated, tip slightly extended beyond plates, lateral subapical surface rugose; connective elongate, subrectangular. Aedeagus (Figs. 23–24) with shaft compressed, length of shaft subequal length of base; gonopore dorsal, subapical; tip of shaft acutely tapered distad of gonopore. Segment X ventrolateral appendage (Fig. 21) with transverse double-pointed apical process, similar to that of *T. montara* Oman, but with dorsal tooth comparatively smaller



Figs. 14-25. 14-17, *Brenda licrocerca*, male genitalia. 14, Genital capsule, lateral view. 15-16, Aedeagus, posterior and lateral views, respectively. 17, Style and connective, ventral view. 18-24, *Tiaga leonensis*. 18, Distal portion of female abdomen, ventral view. 19, Habitus. 20, Head, anteroventral view. 21, Male genital capsule, lateral view. 22, Detail of posterodorsal process of pygofer, dorsal view. 23-24, Aedeagus, lateral and posterior views, respectively. 25, Style and connective, ventral view.

and ventral tooth longer and narrower. *Female*: Sternum VII (Fig. 18) with posterior margin narrowly emarginate to half sternum length. Second valvula (Fig. 13) similar to that of *B. bidentata* but with dorsal preapical angle more pronounced.

Material examined.—Holotype ♂ labeled: "MEX.:N.L.; Galeana/ Cerro Potosi, 10,500ft./VI:26-28:1969/leg. S. & J. Peck; FM(HD) #69-60/pine forest/carrion traps" [FMNH]. Other material: 2♂, 1♀, same data [FMNH, INHS].

Note.—The name of the species refers to the type locality in Nuevo León, Mexico.

DISCUSSION

The three new *Brenda* species closely resemble each other in shape and color pattern and are also very similar externally to *B. arborea*, but differ from *B. arborea* in their smaller size, more conspicuously punctate, yet less densely granulose (shagreened) integument, and the more strongly emarginate margin of the gena below the eye. The male genitalia of the new species are very distinctive, differing markedly from those of *B. arborea* in the shape of the style, segment X appendages and aedeagus. Examined females of the new species differ from those of *B. arborea* in the shape of sternum VII and the second valvula, but no discrete morphological characters were found to distinguish them from each other. The new *Brenda* species are unique among New World Megophthalminae in having cheliform styles, a possible synapomorphy. However, such styles are common among species of certain genera of Agalliinae (e.g., *Agallia* Curtis, *Agalliopsis* Kirkaldy) and, in addition to the similarities in head morphology, leg chaetotaxy, and the segment X appendages, suggest a close relationship between the two subfamilies.

Tiaja leonensis appears to be related to *T. mexicana*, known only from two females collected in the Sierra Madre Occidental, Chihuahua, Mexico. Unlike other species of *Tiaja*, *T. leonensis*, and *T. mexicana* lack a distinct groove near the base of the claval

suture in the forewing. The new species differs from other *Tiaja* for which males are known in the shape of posterodorsal projection of male pygofer, style, apex of anal hook, and female sternum VII. Of those species, *T. leonensis* most closely resembles *T. insula* Sawbridge, recorded from Santa Barbara, Channel Islands, California.

Discovery of the new species described herein extends the known range of both New World megophthalmine genera considerably to the southeast. *Brenda arborea* (Ball), the only previously known species in the genus, is apparently restricted to the coastal hills of California, west of the Sierra Nevada. Of the nine previously known species of *Tiaja*, seven are apparently restricted to Pacific coastal habitats ranging from southern British Columbia to northern Mexico. Because they occur in dense, low-growing vegetation, these leafhoppers are difficult to collect by conventional methods (i.e., sweeping). The remarkable success of preliminary vacuum collecting in Mexico suggests that the Mexican megophthalmine fauna may be considerably richer than available specimens would indicate.

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